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(Reaffirmed 1996)

Indian Standard

SPECIFICATION FOR FLEXIBLE CABLES FOR MINERS' CAP-LAMPS

(First Revision)

First Reprint JANUARY 1998

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 3 *October* 1984

AMENDMENT NO. 1 MARCH 1998
TO
IS 2593 : 1984 SPECIFICATION FOR FLEXIBLE CABLES FOR MINERS' CAP-LAMPS

(First Revision)

(*Page* 5, *clause* **9.1**) — Insert the following new clause after this clause:

'**9.2** For export purpose, the following colour scheme for insulation of core may be used, if required by the purchaser.

Brown for positive core and Blue for negative core.'

(ETD 09)

Reprography Unit, BIS, New Delhi, India

Indian Standard

SPECIFICATION FOR
FLEXIBLE CABLES FOR MINERS' CAP-LAMPS

(*First Revision*)

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(*Continued on page* 2)

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Indian Standard

SPECIFICATION FOR FLEXIBLE CABLES FOR MINERS' CAP-LAMPS

(*First Revision*)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 3 July 1984, after the draft finalized by the Power Gables Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 Miners' cap-lamp consists of a number of components; such as battery with protective cover, cable and head piece with light source. The cables covered in this standard are used to connect the head piece to the battery. This standard will be of help in the purchase of original equipment as well as replacement of cables, wherever necessary.

0.3 This standard was originally published in 1964. This revision has been brought out to take into account the development since then and to make reference to Indian Standards on conductor and elastomer insulation of cables.

0.4 In preparing this standard, assistance has been derived from BS : 4945-1973 "Miners' cap-lamp assemblies (incorporating lead-acid type batteries)", issued by the British Standards Institution.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

SECTION 1 GENERAL

1. SCOPE

1.1 This standard covers the requirements for the flexible cables for miners' cap-lamps.

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*Rules for rounding off numerical values (*revised*).

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions, in addition to those given in IS : 1885 (Part 32)-1971* shall apply.

2.1 Routine Tests — Tests made by the manufacturer on all finished cable lengths to demonstrate the integrity of the cable.

2.2 Type Tests — Tests required to be made before supply on a general commercial basis a type of cable in order to demonstrate satisfactory performance characteristics to meet the intended application.

NOTE — These tests are of such a nature that after they have been made they need not be repeated unless changes are made in the cable materials or design which might change the performance characteristics.

2.3 Acceptance Tests — Tests carried out on samples taken from a lot for the purpose of acceptance of lot.

SECTION 2 MATERIAL

3. CONDUCTOR

3.1 The conductor shall consist of tinned copper and shall conform to the requirements for Class 5 of IS : 8130-1984† with the exception as given in **3.1.1** and **3.1.2** below.

3.1.1 The mass of copper dissolved, when sample wires taken from the conductor are subjected to persulphate test, shall not exceed 7.5 g/m^2.

3.1.2 The resistance of conductor of each core, corrected to 20°C shall not exceed 3.4 ohms per 100 m of finished cable.

4. INSULATION

4.1 The insulation shall be general service elastomeric conforming to requirements of Type IE 1 of IS : 6380-1984‡.

5. CENTRAL STRAIN CORD

5.1 The centre cord shall have a diameter not less than 1.8 mm. It shall be free from significant amounts of copper or other materials capable of having deleterious effect on core insulation. The cord shall meet the requirements as specified in **14.3.**

---

*Electrotechnical vocabulary: Part 32 Cablet, conductors and accessories for electricity supply.

†Specification for conductors for insulated electric cablet and flexible cords *(first revision)*,

‡Specification for elastomeric insulation and sheath of cables (*first revision*).

6. SHEATH

6.1 The sheath shall consist of elastomeric compound conforming to requirements of Type SE3 of **IS** : 6380-1984*. It shall also meet the requirements as specified in **14.5.**

SECTION 3 CONSTRUCTION

7. CONDUCTOR

7.1 The nominal cross-sectional area of conductor shall be 1 mm^2 and formation shall be according to flexibility Class 5 of IS : 8130-1984†.

8. INSULATION

8.1 Thickness of Insulation — The average thickness of insulation shall be not less than 0'50 mm. The smallest of the measured values of thickness of insulation shall be not less than 0.25 mm.

9. IDENTIFICATION OF CORES

9.1 The insulation of the cores shall be coloured, one red and the other black.

10. LAYING UP

10.1 The two cores shall be laid up in a close spiral around the centre strain cord in such a manner that there are not less than two full turns of each core every 25 mm length of completed cable.

11. SHEATH

11.1 The sheath shall be applied by extrusion over the assembled insulated cores, the internal surface of which shall fit the cores so as to fill the interstices.

11.2 Thickness of Sheath — The average thickness of sheath shall be not less than 1.0 mm. The smallest of the measured values of thickness of sheath shall be not less than 0.90 mm.

11.3 Colour of sheath shall be black.

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*Specification for elastomeric insulation and sheath of cables (*first revision*).

†Specification for conductors for insulated electric cables and flexible cords (*first revision*).

12. OVERALL DIAMETER

12.1 The overall diameter of cable shall be 9.0 mm subject to a tolerance of ±025 mm.

SECTION 4 TESTS

13. CLASSIFICATION OF TESTS

13.1 Type Tests—The following shall constitute type tests:

- a) Persulphate test;
- b) Annealing test;
- c) Conductor resistance test;
- d) Test for thickness of insulation and sheath;
- e) Physical tests for insulation and sheath:
    - 1) Tensile strength and elongation at break,
    - 2) Ageing in air oven (for insulation),
    - 3) Ageing in oxygen bomb (for insulation)/air bomb (for sheath), and
    - 4) Oil resistance test (for sheath);
- f) Tests for centre strain cord (**14.3**);
- g) Voltage test (**14.1**);
- h) Checking of overall diameter of cable (**14.4**);
- j) Flammability test (**14.2**); and
- k) Resistance of sheath to fatty acids (**14.5**).

13.2 Acceptance Tests — The following shall constitute acceptance tests:

- a) Persulphate test;
- b) Annealing test;
- c) Conductor resistance test;
- d) Test for thickness of insulation and sheath;
- e) Test for breaking load of centre strain cord (**14.3.1**);
- f) Voltage test (**14.1**); and
- g) Checking of overall diameter (**14.4**).

13.3 Routine Tests — The following shall constitute routine tests:

a) Conductor resistance test, and

b) Voltage test (**14.1**).

14. TEST DETAILS

14.0 General — Unless otherwise specified, the tests shall be carried out in accordance with appropriate part of IS : 10810*, taking into account the additional information given in **14.1** and **14.2** of this standard.

14.1 Voltage Test — This test shall be carried out at an ac voltage of 500 volts applied between conductors for a period of 5 minutes. There shall be no breakdown of insulation.

14.2 Flammability Test — The sample shall be exposed to the flame, for a period of 10 seconds. On removal of the sample from the flame, any burning that might have initiated shall cease within 30 seconds and the combustion shall be confined to the area affected by the flame.

14.3 Test on Centre Strain Cord

14.3.1 *Test for Breaking Load* — A sample of the cord removed from the finished cable shall be subjected to a tensile test and shall have a breaking load of not less than 27 kg.

14.3.2 *Determination of Copper and Manganese Content* — The copper and manganese contents of the centre strain cord shall be determined and neither shall exceed 0.005 percent by weight.

14.4 Checking of Overall Diameter — The overall diameter of the cable shall be measured with a micrometer having an accuracy of 0.01 mm and shall conform to the values specified in **12.1.**

14.5 Resistance of Sheath to Fatty Acids — A weighted sample of the sheath about 8 cm long with the cores removed, shall be immersed in a mixture of commercial fatty acids of the following composition by weight:

Oleic acid	60 percent
Stearic acid	20 percent
Palmitic acid	20 percent

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*Methods of test for cables.

In addition, a sample of complete flexible cable about 300 mm long, bent into U-form, shall be suspended in the same mixture with its ends clear of the liquid.

14.5.1 The samples shall remain immersed in the mixture for 4 days, at a temperature of 70 ± 1°C, after which they shall be removed, wiped clean and cooled to room temperature.

14.5.2 The increase in weight of the sheath sample, and In diameter of the cable sample, shall not exceed the following:

Weight increase	50 percent
Diameter increase	20 percent

SECTION 8 IDENTIFICATION, PACKING AND MARKING

15. MANUFACTURER'S IDENTIFICATION

15.1 The manufacturer shall be identified throughout the length of cable by means of a tape bearing manufacturer's name or trade-mark or by manufacturer's name being printed, indented or embossed on the outer sheath. In case none of these methods can be employed or if the purchaser so desires, coloured identification threads in accordance with a scheme to be approved by the Indian Standards Institution shall be employed.

16. PACKING AND MARKING

16.1 The cable shall be either wound on reels, drums or supplied in coils packed.

16.2 The cable shall carry the following information either stencilled on the reel or drum or contained in a label attached to it:

a) Reference to this Indian Standard, that is 'Ref ISS 2593';
b) Manufacturer's name, brand name or trade-mark,
c) Type of cable;
d) Nominal cross-sectional area of conductor;
e) Length of the cable on the reel, drum or coil;
f) Number of lengths on the reel, drum or coil (if more than one);

g) Approximate gross mass;

h) Country of manufacture; and

j) Year of manufacture.

16.2.1 The cable (reel, drum or label) may also be marked with the Standard mark.

16.2.2 The use of the Standard Mark is govered by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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